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PROGRESSIVE MUSCLE RELAXATION
AND PAIN PERCEPTION IN
ABDOMINAL SURGERY PATIENTS

by

Bonnie A. Mertely

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Master of Science

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ABSTRACT

This study was conducted to determine if use of progressive muscle relaxation could decrease pain perception, analgesic use, and anxiety in post-operative abdominal surgery patients. Review of demographic data showed the experimental and control group to be essentially equal in the demographic variables recorded. Analysis of covariance was done on mean pain and anxiety measures between groups. No statistical differences were found. The experimental group experienced a trend toward a decrease in post-operative pain after treatment during and after early ambulation, while the control group's post-operative pain essentially stayed the same or increased during and after early ambulation. Subjects in the experimental group used less analgesics over the first 24 hours after surgery than the control group. The state and trait anxiety scores were essentially the same between groups with the control group's state anxiety being slightly less than the experimental group after treatment.

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DEDICATION

This Thesis is Dedicated to the
Memory of

Doctor Ruth Zornow

(1937 - 1989)

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CHAPTER 1

Introduction

Pain is a total experience encompassing sensory and reactive components which are interdependent and inseparable (Zborowski, 1969). It is one of the most important human responses diagnosed and treated by nurses. Perception of pain is unique to each individual, and dependent on many factors such as focus of attention, coping style, cultural background, previous experience with pain, anxiety level, and perceived control (Wells, 1982).

A review of more than 2100 nursing diagnoses and problems showed pain to be the most frequently occurring nursing problem among acute medical-surgical patients (Kim, 1984). Thousands of Americans undergo abdominal surgery every year. In the aftermath of surgery, these individuals experience pain secondary to tissue damage. However, pain is not an isolated event that can be turned off with sufficient medication. It is a combination of sensory and affective components that may not be satisfactorily controlled by medication alone. Interviews with patients after surgery reveal few patients were satisfied with the way their pain was managed (Wells, 1982). Perception of pain slows recovery and increases length of hospital stay (Egbert, Battit, Welch, & Bartlett, 1964).

Nurses have long been interested in interventions for pain that could be used as adjuncts or alternatives to narcotics. Positioning, splinting of the operative site, backrubs, and heat are some alternatives that have been used in the past.

Statement of the Problem

Analgesics are available to relieve pain, but in many cases, are not the treatment of choice. Narcotic analgesics may produce such adverse effects as hypotension, respiratory depression, and decreased level of consciousness (Radwin, 1987). Allergies, chronic disease, and physical frailty may also preclude the use of narcotics as well as non-narcotic analgesics (Levin, Malloy, & Hyman, 1987; Radwin, 1987). Burge, Eichhorn, DeStafano, Foley, Hoothay, and Quinn (1986) studied cardiac surgical patients with pain and their nurses on two units. Forty subjects and forty-one nurses were asked to complete a multiple choice questionnaire about the degree of pain experienced by patients, when and how they requested pain medication, instruction about pain medication, and related information. Results show that in most cases nurses perceived patients' pain to be greater than the patients reported it to be (Burge et al., 1986). Perceptions of pain control also differed: 60% to 65% of patients rated overall pain control as "good" or "excellent"; 30% of nurses rated patients' pain

control as "good", none rated pain control as "excellent". Forty-five to 50% of the patients said that nurses encouraged them to take pain medication. Fifty-eight percent of the nurses said they encouraged patients to take pain medication when needed (Burge et al., 1986). Burge and associates (1986) found no evidence that nurses withheld narcotics for fear of addiction. Although addiction seems not to be a significant problem, narcotic analgesics produce adverse side effects such as respiratory depression and hypotension that hamper post operative recovery (Radwin, 1987). The need for alternative methods of pain relief is evident. An exploration of new methods of pain control is necessary to reduce suffering associated with surgery and other pathological conditions and improve recovery time of surgical patients. It has been postulated that relaxation training can be used to decrease muscle tension, a source of post operative pain, as well as alter the psychological variable of anxiety.

Purpose

The purpose of this study was to determine the effect of progressive muscle relaxation (PMR) on pain perception, analgesic use, and anxiety in post-operative abdominal surgery patients.

Definitions

The following section defines the major variables under consideration in the study. It is divided into theoretical definitions and operational definitions.

Theoretical definitions. 1. Pain is a complex perceptual experience comprising of sensory and affective dimensions (Melzack, 1973).

2. Relaxation is a state of decreased muscle tension and decreased anxiety (Levin, Malloy, & Hyman, 1987).

3. Narcotic analgesics are drugs that activate opiate receptors in the central and peripheral nervous systems producing an altered perception of pain (Coyle, 1987).

4. Anxiety is an emotional state characterized by feelings of general, continuous apprehension, and symptoms of tremulousness, sweating, palpitations, chest pain, and "butterflies" in the stomach (Oken & Lakovics, 1982, p. 85-86).

Operational definitions. 1. "Pain is whatever the experiencing person says it is, existing whenever he says it does" (McCaffery, 1979, p. 11).

2. Pain perception is a subjective appraisal by an individual of the amount of discomfort experienced as a result of surgical intervention as measured by scores received on a visual analog pain scale and a 6 point

behavioral rating scale (BRS-6). Because "pain perception" is the term used in this study, it includes not only actual physiological pain experienced, but more importantly, to what extent the patient perceives this pain as distressful.

3. State anxiety, as measured by scores received on Spielberger's State/Trait Anxiety Inventory, is a transitory anxiety characterized by conscious feelings of apprehension, tension, and initiated fight or flight response.

4. Trait anxiety is an individual's anxiety-proneness as measured by scores received on Spielberger's State/Trait Anxiety Inventory.

5. Progressive muscle relaxation is a technique of mentally focusing on 16 major muscle groups and telling them to relax. It involves a repetitive process beginning with the muscles of the feet and working to the muscles of the head and face (Appendix A).

6. Pain medication administered is defined for the purpose of this study, as the amount of narcotic analgesic administered in the first 24 hours after surgery converted into Demerol equivalency for purposes of comparison.

7. Early ambulation is the first or second time out of bed walking outside the subject's room after surgery.

Statement of Hypotheses

The following hypotheses were tested:

I. Abdominal surgery patients who use progressive muscle relaxation after surgery will report less perception of pain post-operatively than those who do not use the technique.

II. Abdominal surgery patients who use progressive muscle relaxation after surgery will require less medications for pain than those who do not use the technique.

III. Patients who use progressive muscle relaxation after surgery will demonstrate lower levels of state and trait anxiety as measured by Spielberger's State/Trait Anxiety Inventory than those who do not use the technique.

CHAPTER 2

Theoretical Framework and Review of Literature

This chapter includes a description of the theoretical framework and the review of literature. The concept of pain, its neuroanatomy and neuro-physiology, will be reviewed. Next, the arousal and relaxation responses will be presented to clarify the theoretical basis for the use of progressive muscle relaxation to decrease pain perception. Lastly, the concepts of stress and anxiety and their effect on pain will be discussed. Relevant research will be reviewed to clarify the impact of psychological factors on the pain response cycle. The affect theory of pain, as well as Johnson's parallel response model will be discussed. Finally, several studies using relaxation as a method to decrease anxiety and pain will be discussed and the results examined and compared.

Theoretical Framework

Pain is a product of sensory and affective components of the central and peripheral nervous systems (Sternbach, 1968). These two components comprise the pain a person experiences and perceives (Beecher, 1956). The more pain experienced and perceived by an individual, the more the individual will attempt to relieve that pain (Johnson & Leventhal, 1971). In the case of traditional

post-operative care, this means use of analgesics will increase (Johnson & Leventhal, 1971) (see Figure 1).

↑anxiety -----> ↑pain ----->↑analgesic use

Figure 1. Diagram of the model of the relationship among anxiety, pain, and analgesic use.

Because analgesics are not always the treatment of choice, health care personnel are interested in alternative methods to decrease pain (Wells, 1982).

Anxiety has been shown to increase pain and pain perception (Hosking & Welchew, 1985). If the level of anxiety can be decreased, experienced pain and perception of pain should decrease (Beecher, 1956). Progressive muscle relaxation is one method available to decrease anxiety (Scandrett, Bean, Breeden, & Powell, 1986). It also decreases skeletal and smooth muscle tension (Benson, 1984). Decreased muscle tension and decreased anxiety should lead to decreased pain which in turn will lead to decreased analgesic usage (Hosking & Welchew, 1985) (see Figure 2).

PMR ---> ↓anxiety ---> ↓pain ---> ↓analgesic use

Figure 2. Diagram of the proposed relationships among progressive muscle relaxation, anxiety, pain, and analgesic use.

Review of Literature

In the review of the literature the linkages between the concepts of pain, anxiety, and progressive muscle relaxation are elucidated.

Pain

Pain is a total sensory, cognitive, and reactive experience of the human mind and body (Zborowski, 1969). Many factors influence the perception of pain. Culture, age, gender, religious background, social support, and race are factors identified in literature which influence pain perception. Often, the findings from various studies do not agree, although certain generalizations have been made.

Neuroanatomy. The nervous system is the anatomical substrate for experiencing pain. It consists of three parts: the central nervous system, the peripheral nervous system, and the autonomic nervous system. These are inter-connected and inter-related (Hosking & Welchew, 1985).

The central nervous system consists of the brain and the spinal cord. Five main parts of the adult brain develop from subdivisions of the embryonic central nervous system. The spinal cord extends from the most caudal part of the brain, the medulla (Angevine & Cotman, 1981).

The peripheral nervous system consists of the spinal nerves, which transmit nervous impulses between the spinal cord and the periphery, and the cranial nerves which conduct nervous impulses between the brainstem and the head and neck (Angevine & Cotman, 1981). Peripheral nerves, except some cranial nerves, carry both sensory and motor fibers (Hosking & Welchew, 1985). The sensory nerve fibers carry information from the body to the central nervous system. The motor nerve fibers carry impulses from the central nervous system to the muscles (Hosking & Welchew, 1985).

The autonomic nervous system consists of two subdivisions: the sympathetic nervous system (SNS) and the parasympathetic nervous system (PNS). These two subdivisions work as opposing forces to maintain balance in the system (Nuernberger, 1981). Some of the cranial nerves, the "special visceral efferent" fibers, are also functional components of the parasympathetic division of the automatic nervous system (Angevine & Cotman 1981).

The sympathetic nervous system responds to a stimulus with the "fight or flight response" or arousal. Sympathetic arousal stimulates the body to prepare for action. The heart rate increases, lung airways expand, the pupils enlarge, blood is shunted from the digestive and excretory organs and sent to the skeletal muscles. The skeletal muscles prepare to act (Nuernberger, 1981).

The physiological response to this stimulus is potentiated by the release of the neuro-transmitter epinephrine (Hosking & Welchew, 1985). When stimulated by sympathetic fibers, the adrenal medulla secretes epinephrine which stimulates sympathetic nervous system functions (Sternbach, 1968). The initial sympathetic neural reaction to a stimulus is more rapid and of shorter duration, while hormonal response begins later and often persists long after the stimulus has disappeared (Sternbach, 1968). Thus the physiological changes associated with sympathetic arousal may persist even after the stimulus has been removed.

The parasympathetic nervous system has an entirely different autonomic pattern which Benson (1975) called the Relaxation Response. The parasympathetic nervous system releases acetylcholine at its receptor sites which causes the opposite effect from the action of the SNS (Nuernberger, 1981). Benson described parasympathetic activities as those associated with relaxing and regulating the body. The focus is on inward activities of nourishment, excretion, repairing tissues, and building up energy and fuel supplies (Nuernberger, 1981). The parasympathetic nervous system response helps to balance the functions of the body. It serves as a homeostatic mechanism (Sternbach, 1968).

Only in the last 20-30 years has it become apparent that we have voluntary control over the autonomic nervous system through visceral learning or biofeedback (Benson, 1984). Research in the 1950s and 1960s showed Zen monks could decrease their oxygen consumption and metabolism by as much as 20% through deep meditation (Benson, 1984).

Pain pathways. The skin, muscles, viscera, and the tissue around the bone have microscopic organs called pain receptors, which, when stimulated, transmit impulses to the central nervous system (Hosking & Welchew, 1985). Pain receptors can be divided into two groups, the A delta fibers, and the polymodal nociceptors (C fibers with free nerve endings) (Kelly, 1985). The A delta fibers are small, thinly myelinated fibers that are aroused primarily by heat and mechanical stimuli (Kelly, 1985). The polymodal nociceptors are unmyelinated fibers distributed throughout the skin and deep tissue. They respond to high intensity mechanical, chemical, and thermal stimulation, and are believed to be activated by chemicals released into extracellular spaces as a result of tissue damage (Kelly, 1985). The impulses conducted by A delta and C fibers travel more slowly than other sensory or motor impulses (Hosking & Welchew, 1985). Nerve fibers that carry the pain stimulus may belong to either the sensory nervous system or the autonomic nervous system (Hosking & Welchew, 1985).

Cell bodies of the A delta and C fibers are located in the dorsal root ganglia. These fibers project to the dorsal horn of the spinal cord where they synapse on second order neurons. These neurons, in turn, project to the reticular activating system, to posterior thalamic nuclei, and to periaqueductal grey matter which is known to have a high concentration of endorphin containing cells (Kelly, 1985). Projection of pain fibers to the reticular activating system is thought to be the basis for alerting behaviors associated with pain. The projections to periaqueductal grey matter are thought to be important in alteration of pain responses by the emotional state of the person because of reciprocal connections between periaqueductal grey matter and the diencephalic structures which receive input from the limbic system (Kelly, 1985).

Gate Control Theory

The Gate Control Theory of Pain developed by Melzack and Wall suggests that pain receptors, which transmit an impulse to the dorsal root of the spinal cord, conduct the impulse more slowly than the other sensory nerves (Melzack, 1973). Often therefore, non-painful impulses reach the spinal cord before the painful stimuli and close the pain gates in the dorsal horn and interfere with pain perception. The impulse may theoretically never reach the higher parts of the nervous system

((Hosking & Welchew, 1985). However, if the impulse is strong enough or continues over a long enough period of time, they re-open the pain gates and allow the impulse to travel up to the brain along the anterolateral tracts of the spinal cord (Hosking & Welchew, 1985). A few of the impulses may travel up ipsilateral tracts to the lowest level of the brain, and then cross over to the opposite side. The majority of the impulses cross to the opposite side of the spinal cord at approximately the level of entry into the spinal cord and then travel to the brain along the anterolateral tracts (Kelly, 1985).

According to the Gate Control Theory of Pain, pain gates in the spinal substantia gelatinosa regulate the firing of cells deeper in the dorsal horn. Recent evidence suggests that gating may occur at other locations also. The brain monitors the spinothalamic activity for a critical level at which pain is felt (Kelly, 1985). The brain also initiates efferent, inhibitory control on ascending pain impulses. There appears to be an endogenous brainstem analgesia system which can be activated by morphine or endogenous opiates such as endorphins (Kelly, 1985). The efferent, inhibitory pathway appears to begin in the thalamus where the spinothalamic pathway synapses. It continues to the reticular formation, the fibers of the spinoreticular tract, and finally to neurons in the posterior horn of

the spinal cord where they terminate presynaptically on primary afferent fibers, preventing the incoming sensory fibers from carrying the pain impulses to the brain (Hosking & Welchew, 1985). It is believed that these descending inhibitory impulses may account for the decrease of pain experienced by use of distraction, the pain increasing effect of emotions, and the effects of learned response to pain (Kelly, 1985).

Affect Theory of Pain

The affect theory of pain holds that in addition to the sensory quality, pain has a strong negative affective quality that drives the individual experiencing it to activity to decrease it or stop it. This behavior deals with emotion and motivation (Melzack, 1973). Melzack (1973, p. 148) quoted Sherrington who at the turn of the century stated, "the mind rarely, probably never, perceives any object with absolute indifference, that is, without feeling. . . affective tone is an attribute of all sensation, and among the attribute tones of skin sensation is skin pain." Titchener wrote, "the pain of a toothache, is localized at a particular place, in the tooth; but the unpleasantness of it suffuses the whole of present experience, is as wide as consciousness. The word pain . . . often means the whole toothache experience." (Melzack, 1973, p. 148-149). It is believed that the brainstem reticular formation and the

limbic system play an important role in the affective dimension of pain (Melzack, 1973). The nerve fibers that carry impulses to this area are not organized to carry discrete spatial or temporal information. Their receptor sites in the brain have wide receptive fields that may cover more than half of the body's surface area (Melzack, 1973). The limbic system, which is connected to the reticular formation of the brain plays an important role in the aversive drive and affect that comprise the motivational dimension of pain (Melzack, 1973).

The amount and quality of perceived pain are determined by many variables such as anxiety, suggestion, culture, past experiences, and present meaning (Wells, 1982). Beecher (1956) called this the processing, or reaction component of pain. These cognitive factors have a profound effect on pain perception (Melzack, 1973). Cognitive factors may act selectively on sensory processing and motivational mechanisms. Sensory input can be localized, identified, and modified on the basis of past experience before it activates discriminative and motivational responses (Melzack, 1973).

Johnson's parallel response model. Johnson's parallel response model (1971), a component of the affect theory of pain, proposed that anxiety and fear can influence the subjective experience of pain. Johnson and colleagues (1971) examined the effects of patient and

situational variables on emotional and instrumental behaviors among patients hospitalized for elective surgery. They concluded that fear and coping responses were products of a cognitive process of assessment of environmental threats. The individual's behaviors become the stimulus for further actions. Threatening situations are composed of danger stimuli and fear stimuli (Johnson, Leventhal, & Dabbs, 1971). Either of these stimuli may elicit behaviors to influence the environment (Johnson et al., 1971). The individual experiencing pain (a threat) will attempt to reduce the fear and distress caused by that pain. He will ask for pain medication, attempt relaxation, or request other assistance. Johnson and colleagues (1971) reported statistically significant results comparing manifest anxiety and post-operative fear. Patients with high manifest anxiety scores reported higher levels of fear than patients with lower manifest anxiety scores ($F = 3.36$, $p < .05$). Furthermore, perception of pain was related to level of anxiety. Patients with high manifest anxiety scores reported more pain ($F = 4.30$, $p < .05$).

Reducing anxiety can reduce the perception of pain. Beecher (1969) theorized that it is impossible to diagnose pain from patient's behavior. He cited an example of a wounded soldier who was struggling and screaming with apparent pain. Beecher felt that hysteria

based on fear was the basic problem. He administered 120mg of amobarbital sodium intravenously. The soldier immediately calmed down and stopped screaming. He had thought he was lying on his rifle and was struggling to get off (Beecher, 1969).

Anxiety. The concepts of fear and anxiety are as old as time. Fear has been studied historically for much longer than anxiety. It has not been until the early years of this century that anxiety has been recognized as a distinct and pervasive human condition (Spielberger, 1983). It was Freud who first defined anxiety and posed its role in personality theory. Freud defined anxiety as "something felt"; a specific unpleasant emotional state or condition of the human organism that included experiential, physiological, and behavioral components (Spielberger, 1983).

Currently, anxiety is most often used to describe an unpleasant emotion or condition characterized by feelings of general, continuous apprehension, and symptoms of tremulousness, sweating, palpitations, chest pain, and "butterflies" in the stomach (Oken & Lakovics, 1982). It is also used to describe relatively stable individual differences in anxiety-proneness as a personality trait (Spielberger, 1983). Anxiety is a construct of two dimensions, state and trait anxiety (Spielberger, 1975). State anxiety is a transitory emotional state

characterized by conscious feelings of apprehension, tension, and initiated fight or flight response. State anxiety exists in a particular moment in time and at a particular intensity level (Spielberger, 1983). Trait anxiety is a measure of an individual's anxiety proneness. It reflects a specific, individual tendency to perceive stressful situations as threatening and respond to these situations with an increase in state anxiety levels (Spielberger, 1983). It is the result of frequent and intense elevations in state anxiety over time (Spielberger, 1970). Integration of state and trait variables make up the psychological component of pain and individualizes the pain experience (Wells, 1982).

Anxiety heightens pain and conversely, acute pain increases anxiety (Hosking & Welchew, 1985). Frequently, it is difficult to distinguish which variable is the cause or the effect. Relief of anxiety decreases the level of pain experienced and conversely, decreasing the level of pain may decrease anxiety (Hosking & Welchew, 1985).

Beecher provided an example of the role anxiety may play in the pain experience. Beecher (1956) studied the effect of "the meaning of the pain experience" on perception of severity of pain. He examined two groups of individuals. The first group consisted of soldiers (N = 150) with extensive battlefield wounds. The second

group were male civilians (N = 150) requiring surgical intervention. The study was conducted in interview style to determine the subjects' perception of pain. Subjects were asked if they were having any pain. If they were having pain, was it slight, moderate, or severe? Those who responded that they were experiencing pain were asked if the pain was great enough that they wanted something to relieve it (Beecher, 1956). Only 32% of the soldiers, when questioned, said they had enough pain to want anything for it. In the civilian surgical group, 83% said they had enough pain to want something to relieve it (Beecher, 1956). His study demonstrated that despite the greater level tissue injury suffered by the soldiers, they experienced far less pain and required less medication for pain control than did the civilian surgical patients (Beecher, 1956). He attributed this difference to the processing phase of the pain experience. Whereas the soldier interprets the pain experience positively (low anxiety with removal from danger), the civilian perceives the pain as a signal of threat and anxiety level is high (Beecher, 1956). This supports the affect theory of pain which purports that pain perception is affected by many variables including anxiety. Anxiety level in this case is determined by how the individual interprets the pain experience.

Impact of psychological factors on pain. Emotional factors can decrease the severity of pain or relieve it altogether (Merskey, 1977). Psychological factors often cause pain and increase the perception of its severity (Merskey, 1977). Merskey (1977) described psychogenic or psychosomatic pain as somatically perceived pain caused mainly or wholly by psychological factors. Though the genesis of the pain is different from organically induced pain, there is no difference between subjective experience of the two (Merskey, 1977). Merskey (1977) described three mechanisms identified in the etiology of psychogenic pain: hallucination, conversion hysteria, and muscle tension. The first is seen rarely and is associated with schizophrenia and pathological depression. The second mechanism is also a rare occurrence. Pain may not arise as a result of physiological process, but as a difficult to understand chain of psychological events, such as in conversion hysteria. The last, and most common mechanism, is the production of pain due to muscle tension, which itself may result from psychological causes. Anxiety gives rise to local muscle contractions, which, if persist, cause pain (Merskey, 1977).

There is more to pain than a sensation that is transmitted to the brain. An individual not only perceives pain, but also feels and reacts to it. The

physiology of hearing sound does not explain a listener's emotional response to that sound. Nor does understanding of the physiological mechanism of sight explain the response felt when viewing an indescribably beautiful view (Zborowski, 1969). Similarly, physiological theory alone cannot account for the patient's response to pain.

Concept of stress. Theoretical orientations of stress in health related literature can generally be categorized into four groups: 1) stress as a stimulus, 2) stress as a response, 3) stress as a transaction, and 4) stress as atheoretical (Lyon, & Stehle-Werner, 1987). Stress as a response is the theoretical construct used in this study.

Selye most clearly defined the theoretical construct of stress as a response. He defined stress as the body's non-specific response to any demand placed on it (Selye & Horava, 1953). These demands are called stressors. The body responds to stressors in a stereotypical manner, regardless of the type of stressor. The body's response is comprised of three distinct stages, making up what Selye (1953) called the General Adaptation Syndrome (GAS). These stages are the alarm, stage of resistance, and stage of exhaustion.

During the alarm stage, an individual, when faced with a real or perceived threat, responds with an autonomic arousal mechanism, the fight or flight

response. This response mobilizes the body's resources to protect itself from harm (Nuernberger, 1981). The fight or flight response includes a multitude of physiologic changes associated with sympathetic arousal controlled by the autonomic nervous system (Selye & Horava, 1953).

The second stage of GAS is the stage of resistance. In this phase of the stress response, the body attempts to regain homeostasis by adapting or compensating for physiologic arousal (Nurnberger, 1981). Length of the stage of resistance is dependent on the intensity of the stressor and an individual's level of adaptive energy. If exposure to stressors continue, the body wears out and the final stage, exhaustion, occurs (Appelbaum, 1981).

In the stage of exhaustion, the body depletes its store of reserve or adaptive energy. Physiological systems break down and pathological changes occur. The individual enters a disease state, which ultimately, if uncontrolled, leads to death (Nuernberger, 1981).

Relationship between pain and relaxation.

Activation of the autonomic nervous system by pain stimulus activates both the parasympathetic nervous system and the sympathetic nervous system. Parasympathetic activation has a compensatory antagonistic response called the Relaxation Response (Benson, 1984). The major physiologic changes associated

with the relaxation response are: decreased metabolism, decreased blood lactate levels, decreased level of SNS activity, and increased brain alpha wave activity (Benson, 1984). These changes provide benefits to the individual. Alpha waves are relatively low frequency brain waves (8-15 per second) present in a state of relaxed wakefulness (Isselbacher, Adams, Braunwald, Petersdorf, & Wilson, 1980). An increase in alpha wave activity has been associated with feelings of well-being (Benson, 1984). Pitts and McLure demonstrated in 1967 that high blood lactate levels can provoke anxiety attacks. A decrease in the blood lactate is associated with decreased levels of anxiety (Benson, 1984).

Use of progressive muscle relaxation (PMR) as a therapeutic modality to increase locus of control in hypertensive patients, control nausea in cancer patients receiving chemotherapy, and reduce intensity and duration of asthma attacks in asthmatic patients is well documented in the literature (Pender, 1985; Cotanch & Strum, 1987; and Freedberg et al., 1987).

Aiken (1972) conducted a descriptive study of the effect of PMR on 15 male open heart surgery patients. The subjects were taught deep muscle relaxation, and observations were obtained on subjective responses for calmness, ease, tranquility, heaviness, and sleepiness. Subjects using progressive muscle relaxation reported

that they felt more relaxed after surgery than those not using the technique (Aiken, 1972). Observation of subjects demonstrated an increase in individual verbalization of concerns about surgery and death and dying (Aiken, 1972). Aiken attributes this opening of communication to be the direct result of the relaxation technique (Aiken, 1972).

Scandrett, Bean, Breeden, and Powell (1986) investigated the effect of biofeedback and progressive muscle relaxation on anxious patients in two studies. Subjects for both studies were selected from inpatient and outpatient services of a state psychiatric hospital, a general hospital, and mental health center. Anxiety was measured using an adaptation of McReynold's anxiety check list, a verbal review of their anxiety symptoms, and EMG readings of the frontalis muscle.

The first study of 23 subjects compared the effects of EMG feedback and progressive muscle relaxation on frontalis muscle tension reduction and subjective report on anxiety symptoms. The second study of 65 subjects examined the same outcome variables for three groups: an EMG feedback group, a group having both progressive muscle relaxation training and EMG feedback, and a control group (Scandrett et al., 1986). In the first study, each subject received ten training sessions of either biofeedback or progressive muscle relaxation

technique. Results indicate no significant differences between groups. Within group EMG levels decreased significantly for the biofeedback group ($t = 2.15$, $p < .05$). There were no significant differences between progressive muscle relaxation and biofeedback groups in symptom decrease (Scandrett et al., 1986). These results supported earlier findings that indicate that decreases in frontalis EMG amplitude are not necessarily correlated with significant reductions in anxiety-related symptoms (Scandrett et al., 1986).

The second study was conducted in the hope that it would provide evidence to clarify the potential role of relaxation training in the treatment of anxiety symptoms. Subjects in the second study received 12 training sessions. The first two sessions served as training for the progressive muscle relaxation technique. Sessions 3-12 were used to train the biofeedback technique. The biofeedback only group was told that the first two sessions were for becoming acclimated to the room. Taped music was played for this group during these sessions. The control group was used to obtain three baseline measures, one on the first day of the study, another on the 10th day, and the last on the 21st day of the study (Scandrett et al., 1986). There was no overall reduction of EMG levels among the three groups. However, a statistically significant reduction of EMG levels

($p = .047$) was found between the fifth and tenth sessions. A self-rating evaluation completed by the subjects at the end of the training sessions indicated that 71% of the subjects reported feeling better. Initial anxiety symptoms were reported decreased in 80% of the subjects (Scandrett et al., 1986).

Progressive muscle relaxation has also been used with success for relief of tension headaches (Janssen, 1983). Eighteen subjects were divided into three groups: biofeedback group, biofeedback and progressive relaxation group, and control group. Subjects' baseline headache activity was compared to headache activity after 12 training sessions and 3 months of using the techniques (Janssen, 1983). No significant differences were found between biofeedback and the combined treatment as to their effect on frontalis or neck EMG muscle tension. Both treatment modalities led to decreased EMG levels of both muscles over passage of training sessions (frontalis, $F = 6.80$, $p < .005$; neck muscle, $F = 4.25$, $p < .05$) while the control group values remained stable (Janssen, 1983).

Turner (1982) studied the effect of progressive muscle relaxation and cognitive-behavioral group therapy on control of chronic low back pain. Their sample consisted of three females and 33 males referred from an orthopedic back surgery clinic. All subjects' current

episodes of back pain were of at least three months duration (Turner, 1982). Subjects were assigned by matching technique to one of the two experimental conditions or the waiting list (control group). Measures were obtained to assess physical and psychosocial dysfunction, depression, and pain. Analyses of covariance were completed to determine whether patients showed significant improvement following treatment (within conditions), and whether there were significant differences between conditions controlling for pre-treatment differences (Turner, 1982). Control group patients remained the same or worsened, while subjects in both treatment groups showed significant improvement post-treatment ($F = 8.47, p < .001$; $F = 14.73, p < .001$; $F = 5.14, p < .01$), respectively, for Sickness Impact Profile, visual analog pain scale ratings, and daily pain-severity ratings. For each of these measures there were significant post-treatment differences ($p < .05$) between treatment groups and control group (Turner, 1982). Patients in the relaxation-training and cognitive-behavioral groups did not differ significantly in post-treatment measures on any of the dependent variables (Turner, 1982). Results indicated that both relaxation and cognitive-behavioral therapy produced significant improvement in several problematic areas for chronic back pain patients.

Crockett and colleagues (1986) compared three treatment modalities for myofacial dysfunction syndrome (Crockett, Foreman, Alden, & Blasberg, 1986). Twenty-one females were randomly assigned to one of three treatment groups: dental splint and physiotherapy, a relaxation program, or a minimal treatment program involving transcutaneous electrical nerve stimulation. Improvement was assessed through repeated dental examination measures, self-monitoring of pain, and a series of EMG activity measurements (Crockett et al., 1986). Pain was rated on a 5-point Likert Scale. EMG activity of masseter muscle was assessed under both resting and task conditions. Dependent variables were measured and analyzed with one-way repeated measure multivariate analysis of variance (MANOVA). Dental ratings were significant for repeated measure effect, ($F = 9.22$, $p < .001$) associated with pre- to post-treatment changes. Dentists rated subjects pain to palpation less in the treatment groups than in the control groups (Crockett et al., 1986). Patient's self reports of pain were significant for treatment effect ($F = 2.33$, $p < .05$). Analysis of variance indicated that the only measure to show significant overall treatment effect was average weekly frequency of pain ($F = 5.25$, $p < .05$). The relaxation and dental physiotherapy groups reported lower pain frequency than

the control (TENS) group. All three treatment groups displayed significant changes on worst pain rating. The relaxation group reported significantly less pain intensity than the control group (TENS), while the dental/physiotherapy group reported significantly less frequency of pain than the control group (Crockett et al., 1986). Electromyographic activity measures for the masseter muscle were tested for significance by MANOVA. Results indicated no significant differences among the groups prior to treatment. Multivariate analysis of variance for time effect was significant post-treatment ($F = 10.38, p < .001$). Analysis of variance indicated a significant decrease in pre- to post-treatment EMG activity $F = 15.18, p < .01$; $F = 27.64, p < .001$; $F = 7.48, p < .05$, respectively, at rest, during Static-Steadiness, and during the Maze tasks for the relaxation and dental physiotherapy groups (Crockett et al., 1986). Results of self-reported pain frequency and intensity, measures suggest that the dental/physiotherapy group experienced a reduction in pain frequency but not intensity and the relaxation group experienced a reduction in both pain frequency and intensity (Crockett et al., 1986). Crockett and colleagues question the efficacy of using the TENS group as a control since TENS treatment is a credible treatment for pain for these subjects (Crockett et al., 1986).

Wells (1982) examined the effects of relaxation on post-operative muscle tension and pain. Twelve subjects undergoing cholecystectomy were studied. An experimental group was taught a structured relaxation technique while the control group received routine pre-operative teaching. Results indicated those in the experimental group took analgesics less often than those in the control group post-operatively. The main effect for time between doses was significant ($F = 8.4$, $p = .01$) for the use of potent analgesics (Wells, 1982). Subjects in the experimental group consistently reported less post-operative distress. Main effect for treatment was significant ($F = 8.1$, $p = .02$) for post-operative distress ratings (Wells, 1982).

Varni and colleagues (1981) conducted a study to determine the effects of PMR, meditative breathing, and guided imagery in the management of bleeding, arthritic pain, and analgesic usage on a hemophiliac child with Factor VIII inhibitor (Varni, Gilbert, & Deltrich, 1981). The subject was a nine year old child with severe classic hemophilia who developed an inhibitor to Factor VIII four and one-half years prior to the investigation. By age nine, the subject experienced arthritic pain and pain due to bleeding into the joints. He required increased daily dosages of analgesics to control the pain despite the infusion of prothrombin-complex concentrate and joint

immobilization (Varni et al., 1981). As a consequence of bleeding and arthritic pain, the child was wheelchair bound 50% of the time, had been hospitalized 16 times over a four year period, and received analgesics at school (up to 100 mg of Demerol for patient weight of 21 kg) with no relief (Varni et al., 1981). Training in self-regulation of pain perception consisted of use of PMR, meditative breathing exercises, and guided imagery. After regulation training, requests for Demerol were eliminated, and substantially decreased amounts of Tylenol with Codeine were required (Varni et al., 1981). The subject also showed improvement in mobility, normalization of psychosocial activities, and decreased hospitalizations. The child's parents reported an improvement in the child's overall mood. The patient's subjective evaluation of his improvement was described as "almost completely improved" (Varni et al., 1981).

Horowitz and colleagues (1984) conducted a study assessing the use of two techniques, Benson's progressive muscle relaxation and a jaw relaxation technique in increasing comfort levels for open heart surgery patients on their preliminary post-operative ambulation (Horowitz, Fitzpatrick, & Flaherty, 1984). The sample consisted of three groups of 15 subjects each; the two treatment groups, and a control group. Based on verbal reports of pain and vital signs, Horowitz reported that subjects

using either of the relaxation techniques exhibited and reported significantly less pain than the control group. Analysis of variance showed no significant difference for incisional pain rating but did demonstrate a significant difference ($F = 3.67$, $p < .05$) for body distress. During ambulation and post-ambulation pain and distress scores were significant for both jaw relaxation group ($t = -3.09$, $p < .01$; $t = .85$, $p < .01$) respectively for pain and distress; and the progressive muscle relaxation group ($t = -3.88$, $p < .01$; $t = 2.55$, $p < .05$) respectively for pain and distress. Analysis of variance for vital signs measurements were significant for both treatment groups for systolic blood pressure ($F = 4.27$, $p < .05$), and respiratory rate ($F = 3.44$, $p < .05$) (Horowitz et al., 1984). No difference between treatment and control groups was reported in the use of analgesics. Horowitz attributed this to the common practice of nurses to encourage patients to take pain medication routinely (Horowitz et al., 1984).

Levin and colleagues (1987) studied the effectiveness of Benson's Relaxation Technique and rhythmic breathing on management of post-operative pain in 40 female cholecystectomy patients (Levin, Malloy, & Hyman, 1987). Subjects were randomly assigned to one of four groups: rhythmic breathing group (RB) or Benson's

Relaxation Technique group (BRT), an attention-distraction control group (CA), or a standard control group (CB) (Levin et al., 1987). Data were collected and analyzed on post-operative sensation and distress and analgesic use for 72 hours. Analysis of data demonstrated a significant difference ($F = 1.92$, $p = 0.011$) between Benson's Relaxation Technique group and the control groups on combined sensation and distress (Levin et al., 1987).

Egbert, Battit, Welch, and Bartlett (1964) conducted a study to investigate the effects of encouragement and instruction on post-operative pain in 97 elective abdominal surgery patients. This included information about type and location of the pain, when it would occur, and what could be done to decrease it. Subjects in the treatment group were told they could relieve pain due to muscle spasm and tension by a breathing relaxation technique which they were taught (Egbert et al., 1964). Egbert found that patients in the treatment group used significantly less narcotics post-operatively ($p < .01$) than the control group. They were also observed to appear to be more comfortable and in better physical and emotional condition than the control group. Subjects in the treatment group were sent home on an average of 2.7 days earlier than the control group ($p < .01$) (Egbert et al., 1964).

CHAPTER 3

Methodology

This chapter includes a description of the study design, operationalization of variables, description of the sample, information on protection of human rights, and techniques of data collection. Validity and reliability of measurement tools are discussed and a description of the relaxation technique is given. Finally, the proposed data analysis technique is described.

Study Design

The study was designed to determine if progressive muscle relaxation (PMR) affected subjects' perception of pain, use of narcotic analgesics, and level of anxiety. The progressive muscle relaxation technique was the independent variable, with pain and anxiety the dependent variables. Analgesic use was considered a proxy for pain.

A quasi-experimental before-after design was used for this study. Pre-operative abdominal surgery patients were randomly assigned to experimental and control groups. All subjects completed the State/Trait Anxiety Inventory on the evening prior to surgery. The experimental group was taught PMR (see Appendix A) prior to surgery. The control group was taught a technique to be used to get out of bed (see Appendix B). After

surgery, subjects from both groups were assisted by the investigator with early ambulation which was defined as the first or second time walking out of the patient's room after surgery. Prior to this ambulation, both groups filled out the pain scales to obtain a baseline pain level. The experimental group then listened to a taped version of the previously taught relaxation technique. The control group listened to a taped version of the previously taught technique for getting out of bed. All subjects were then assisted out of bed for early ambulation. Pain scales were completed by the subjects at the halfway point of the walk. Upon returning to bed, all individuals again completed the two estimates of pain and the State/Trait Anxiety Inventory.

Sample

A convenience sample of 21 patients undergoing elective abdominal surgery under general anesthesia was selected from two military hospitals in the Southwest.

The sample was limited to adults from 18-70 years of age. Individuals with diabetes, spinal cord injuries, or partial paralysis were excluded from the sample because of the potential for altered pain perception.

Operationalization of Variables

Relaxation Technique

A modified version of Benson's progressive muscle relaxation technique was used as the treatment. This

technique concentrated on relaxation of 16 major skeletal muscle groups (see Appendix A). The investigator used approximately 20 minutes to explain and practice the technique with each experimental subject. A taped version was used post-operatively for reinforcement.

Herman (1987) conducted a study to determine if tensing procedures utilized in the progressive muscle relaxation technique initiated the valsalva response. The valsalva response consists of changes in blood pressure, pulse pressure, heart rate, cardiac stroke volume, and peripheral vascular resistance initiated by an increased intrathoracic pressure when an individual exhales against resistance (Herman, 1987). The vagus nerve is one controlling mechanism of the valsalva response. Stimulating the vagus nerve during valsalva response in cardiovascular patients may predispose them to bradycardia and other dysrhythmias (Herman, 1987). The normal progressive muscle relaxation procedure consists of systematic tensing and relaxing of skeletal muscle groups. In the course of the tensing of muscles, breath holding is common and could produce the valsalva response (Herman, 1987).

Herman studied 60 healthy adults, measuring heart rate while the subjects performed fist, chest, and abdominal tensing and relaxation. Valsalva ratio was calculated by dividing the peak tachycardia occurring

during 15 seconds of tensing by the maximum bradycardia for 15 seconds following release of tension. The results indicated that tensing of the muscles initiates the valsalva response. The mean valsalva ratios for the three tense/relax cycles were closely related. The mean ratio for the abdomen was $\underline{M} = 1.42$, $\underline{SD} = .29$; for the chest was $\underline{M} = 1.40$, $\underline{SD} = .24$; and for the fist $\underline{M} = 1.30$, $\underline{SD} = .20$ (Herman, 1987).

Based on these results, a modified progressive muscle relaxation technique involving no tensing of the muscles was adopted to minimize the chance of syncope after use of the technique during ambulation.

Pain

A visual (linear) analog pain scale (VAS) and behavioral rating scale (BRS-6) were used to measure patient perception of pain. Both scales were completed by the subjects at three times: before treatment, during preliminary ambulation, and after preliminary ambulation.

Visual analog scale. The VAS is a ten centimeter line with "no pain" indicated on the far left and "the worst possible pain" on the far right. Subjects were instructed to draw a slash mark through the line at the point they felt best indicated the amount of pain they were experiencing at that moment.

Revill and colleagues (1976) tested the linear analog pain scale for reliability using two subject

groups ($N = 20$, $N = 39$, respectively) (Revill, Robinson, Rosen, & Hogg, 1976). The research showed that patients can express their opinion relatively accurately by marking the pain line. There was no significant difference between using lines of 10, 15, or 20 centimeters length. The mean error of the subjects was 0.19% for a 15 cm line (95% confidence limits of the group $\pm 2\%$, and for an individual mark $\pm 7\%$) which should make it a sufficiently sensitive technique to detect distinct differences in pain experience. There was excellent correlation between subject's initial pain ratings and repeated ratings of recalled pain experiences ($r = .994$) for pain ratings at 5 minutes; and ($r = .976$) for pain rating at 24 hours (Revill et al., 1976). When comparing variances of rating recalled pain with variances of repeated random marks, there was a significant difference for time ($r = 0.994$, $p = .02$; and $r = 0.95$, $p = .001$, for five minutes and 24 hours, respectively). This indicated that rating pain is unlikely to depend just on remembering where the initial mark on the line was made (Revill et al., 1976).

Huskisson (1974) reviewed the results from his 1972 study comparing the visual analog scale and simple descriptive pain scales. He used both measurements in a group of patients and super-imposed the descriptive terms on the visual analog scale at the end of the experiment.

Results demonstrated approximately equal intervals between the descriptive terms. The distribution of 100 consecutive measurements on the visual analog scale was uniform, making a case for concurrent validity (Huskisson, 1974).

Six point behavioral rating scale. The BRS-6 pain scale asks the subject to rate the intensity of their pain in terms of its behavioral effects. The scale consisted of six descriptive statements about the patient's pain. Each statement was scored from 0, for the description indicating no pain; to 5, for the description indicating incapacitating pain (Jensen, Karoly, & Braver, 1986).

Jensen and colleagues conducted a comparative study of six pain scales (including the BRS-6 and VAS) with 75 chronic pain patients. Results indicated that all six pain intensity measures are similar in terms of construct validity (Jensen et al., 1986). Strength of the relationship between each individual scale and the shared variance of all of the scales was determined by correlating responses to six measures and performing a series of principal axis factor analyses on the correlations. Factor loadings for the BRS 6 were .80, .64, .74, .69, and .72, respectively, for current pain, most pain, least pain, average pain, and average loading (Jensen et al., 1986).

Demerol Equivalency

Data were collected on all subjects regarding narcotic analgesic use for a period of 24 hours after surgery. Narcotic analgesic dosages were converted to Demerol equivalency using pharmacokinetic profile tables (Kastrup, Boyd, Olin, & Hunsaker, 1985, p 809).

Anxiety

Spielberger's State/Trait Anxiety Inventory (STAI) was administered as an estimate of perceived anxiety. This inventory consisted of 40 self-descriptive statements to which the subject responded by marking intensity on a 4 point scale. Half of the questions related to state anxiety, half to trait anxiety.

The inventory has a high degree of internal consistency as indicated by coefficient alphas ($r = .89-.92$) (Spielberger, 1983). Test-retest reliability of the trait anxiety scale ranges from $r = .73-.86$. Test-retest reliability of the state anxiety scale range from $r = .16-.54$ with $r = .32$ as the median correlation (Spielberger, 1983). Low test-retest coefficients of state anxiety scale were expected because state anxiety is highly specific and transitory, reflecting the current amount of anxiety (Spielberger, 1983). Concurrent validity for the trait anxiety scale was supported by the high correlations with the IPAT

Anxiety Scale, $r = .75-.77$; and the Taylor Manifest Anxiety Scale, $r = .79-.83$ (Spielberger et al., 1970).

Human Rights

Permission to conduct the study was obtained from the Arizona State University Human Subject Research Review Committee. Hospital commanders, chief nurses, and patients' physicians at each medical facility were also approached and permission was obtained to conduct the study.

Technique of Data Collection

Individuals who met the criteria for participation in the study were identified by unit nursing personnel on the day of their admission. Nursing personnel requested their participation and notified the researcher of those willing to take part in the study. The researcher then approached the individual, explained the intent of the study (Appendix C), and obtained informed consent (Appendix D). Once informed consent was obtained, the subjects were randomly assigned by toss of a coin to experimental or control groups.

Subjects in both groups received routine pre-operative teaching by unit nursing staff as directed by the unit's operating instructions (Appendix E). This instruction included pre-operative information as well as expectations about ambulation, pain medication, tubes,

intravenous fluids, voiding, eating, incisions after surgery, and finally discharge instructions.

In addition to the routine pre-operative teaching, subjects in the experimental group were taught a progressive muscle relaxation technique that involved no tensing of muscles (Appendix A). On the day prior to surgery, the investigator spent approximately 20 minutes with the subject teaching and practicing the technique. Subjects were told they would listen to an audio tape of the technique after surgery prior to early ambulation.

Patients were reassured that pain medication would be available to them as needed in accordance with doctor's orders. Prior to practicing the technique, the State/Trait Anxiety Inventory was administered to each individual (Appendix F). Each subject was then instructed in the post-operative use of the analog pain scale and the Behavioral Rating Scale 6 (BRS-6) (Appendix G).

As with the experimental group, routine pre-operative teaching was given to the control group by the unit nursing staff. In addition, the investigator talked individually with these subjects for approximately 20 minutes on how to get out of bed post-operatively (Appendix B). Subjects were told they would listen to an audio tape of these instructions prior to early ambulation after surgery. The State/Trait Anxiety

Inventory was administered to each individual followed by instructions in the post-operative use of the analog pain scale and the BRS-6.

Subjects in experimental and control groups were visited by the investigator on the day of surgery or the first post-operative day and assisted with early ambulation. Subjects in the experimental group completed pain scales prior to treatment. They then listened to a taped version of the previously taught progressive muscle relaxation technique. Each subject was assisted out of bed and ambulated. The subject completed pain scales during the walk and after returning to bed. This was done to account for changes in pain perception caused by returning to bed. After returning the subject to bed, the investigator re-administered the State/Trait Anxiety Inventory.

The control group was also assisted by the investigator with early ambulation. Subjects completed pain scales and then listened to taped instructions of the previously taught technique on how to get out of bed. Subjects were assisted with ambulation and asked to complete pain scales during, and immediately following early ambulation. After returning to bed, the State/Trait Anxiety Inventory was re-administered.

Demographic data were collected on all subjects for the variables of age, gender, ethnicity, type of surgery,

physician, and finally, time, type and amount of last dose of pain medication prior to ambulation. Data were collected on the amount of medication used the first 24 hours after surgery and converted to Demerol equivalents.

Data Analysis

The demographic data were analyzed using descriptive methods. Frequencies, percentages, means, standard deviations, and ranges were utilized where appropriate.

An analysis of covariance between groups was conducted for the following variables: pain, anxiety, and analgesic use. Controlling for pre-existing pain and anxiety allowed more accurate observation of the effects of the treatment (progressive muscle relaxation) on the two estimates of pain. Pain scores obtained from the subjects in experimental and control groups during, and after early ambulation, and state and trait anxiety score totals after treatment were analyzed using pain scores before ambulation and anxiety scores before surgery as the covariants.

CHAPTER 4

Results

Introduction

The purpose of this study was to determine if use of progressive muscle relaxation could decrease pain perception, analgesic use, and anxiety in post-operative abdominal surgery patients.

After a review of the demographic data of the sample under study, pre- and post-treatment scores for pain, analgesic use, and anxiety for both experimental and control groups were examined to determine if significant change occurred. Analysis of covariance was used to determine if there was a statistically significant difference between groups. The level of statistical significance was set at $p = .05$.

Demographic Data

The investigator approached 27 patients to ask them to participate in the study. Two persons declined to participate. Of the 25 persons who agreed to participate and who met the pre-operative selection criteria, four (16%) were excluded on the day of surgery (one because anesthesia was changed from general to spinal, and three individuals because they were walked twice before arrival of the investigator). No subject who agreed to participate chose to drop from the study after beginning. No one in the sample experienced any post-operative

complications. Overall, subjects in the two groups did not differ greatly in regard to extraneous demographic variables. Tests of statistical significance were not done for most of the demographic data due to the small number of subjects in each cell (see Table 1).

The study consisted of a convenience sample ($N = 21$) with 11 subjects in the experimental group and 10 subjects in the control group. Demographic characteristics of the sample are presented in Table 1. The sample consisted of 19 (91%) female subjects and 2 (9%) male subjects. The experimental group contained 9 (82%) females and two (18%) male. The control group contained 10 (100%) females.

Age

Mean age of the entire sample was 38.23 years ($SD = 11.27$ range 23-64 years). The mean age of the experimental group was 39.00 ($SD = 12.12$; range 25-64 years). The mean age of the control group was 37.40 ($SD = 10.85$; range 23-54 years). There was no significant age difference in the experimental and control groups ($t = 0.32$, $p = 0.75$).

Ethnic Background

Ethnic background was varied. In the experimental group, nine (82%) subjects were Caucasian, one (9%) subject was Black, and one (9%) subject was Hispanic. In the control group, five (50%) subjects were Caucasian,

Table 1

Demographic Characteristics of Samples

Variable	Total Sample <u>N=21</u>	Experi- mental <u>n=11</u>	Control <u>n=10</u>
Gender			
Female	19	9	10
Male	2	2	0
Ethnicity			
Caucasian	14	9	5
Black	2	1	1
Hispanic	4	1	3
Oriental	1	0	1
Religion			
Christian	19	10	9
Not indicated	2	1	1
Family Support			
Available	20	10	10
Unavailable	1	1	0
Age \bar{x}^a	38.23	39.00	37.40
SD ^b	(11.27)	(12.12)	(10.85)

^atest of significance $t = 0.32$, $p = 0.75$

^bSD = standard deviation

one (10%) subject was Black, three (30%) subjects were Hispanic, and one (10%) subject was Oriental.

Religious Affiliation and Family Support

Religious affiliation was primarily Christian with 19 (91%) subjects claiming Christian affiliations. Twenty (95%) subjects indicated that family support was available in the local area. The one individual without family support locally was in the experimental group.

Clinical Data

Pain and Anxiety Before Surgery

Subjects' pre-treatment pain and anxiety measures did not differ significantly between groups (see Table 2). The mean VAS before treatment was 3.6 (SD = 2.45; range = 0.3-0.5) for the experimental group, and 3.7 (SD = 2.3; range = 0.9-7.8) for the control group. The mean BRS-6 score before treatment was 3.45 (SD = 1.43; range = 1-5) for the experimental group, and 3.3 (SD = 1.7; range = 0-5) for the control group. There was no statistically significant difference in pain perception between groups before surgery ($t = .1375$, $p = .8921$; $t = .2234$, $p = .8258$) respectively for mean VAS scores and mean BRS-6 scores. The mean state anxiety score before surgery was 41.81 (SD = 15.99; range = 23-77) for the experimental group, and 41.40 (SD = 10.84; range = 28-59) for the control group. The mean trait anxiety score

Table 2

Clinical Characteristics of Sample Prior to Treatment

Variable	Total		Test of	
	Sample	Experimental	Control	Significance p
State Anxiety		41.82 (15.99)	41.40 (10.84)	t = 0.0707 p = .9445
Trait Anxiety		35.18 (10.29)	34.20 (8.02)	t = 0.2449 p = .8092
Pain (VAS) ^a		3.63 (2.45)	3.78 (2.33)	t = 0.1375 p = .8921
Pain (BRS-6) ^b		3.45 (1.44)	3.30 (1.70)	t = 0.2234 p = .8258

Surgical Procedure^c

				NA	NA
Cholecystectomy	5	4	1		
Appendectomy	1	1	0		
Hysterectomy	3	1	2		
Tubal Ligation/ Fulguration	7	1	3		
Diagnostic Laparoscopy	6	1	5		
Other	3	2	1		

Table 2 (cont.)
Clinical Characteristics of Sample Prior to Treatment

Variable	Total		Test of	
	Sample	Experimental	Control	Significance
Medication Time				
Lapse in Hours				
Prior to Treatment				
1-2 hours	1	0	1	NA
> 2 hours	13	7	6	
no meds	7	4	3	

^aVAS = Visual Analog Scale

^bBRS-6 = Six Point Behavioral Rating Scale

^cSome subjects had more than one procedure.

before surgery was 35.18 (\underline{SD} = 10.29; range = 24-56) for the experimental group, and 34.20 (\underline{SD} = 8.02; range = 21-52) for the control group. There was no statistically significant difference in state or trait anxiety between groups before surgery (\underline{t} = .0707, \underline{p} = .9445; \underline{t} = .2449, \underline{p} = .8092) respectively for state and trait anxiety.

Surgical Procedures

Surgical procedures were varied. In the experimental group, four subjects (36%) had cholecystectomies, one subject (9%) had an appendectomy, one subject (9%) had a hysterectomy, four subjects (36%) had tubal ligations or fulgarations, one subject (9%) had a diagnostic laparoscopy and two subjects (18%) were classified as "other", having various surgical procedures such as hernia repairs or abdominal scar revisions. In the control group, one subject (10%) had a cholecystectomy, two subjects (20%) had hysterectomies, three subjects (30%) had tubal ligations or fulgarations, five subjects (50%) had diagnostic laparoscopies, and one subject (10%) was classified under "other" surgical procedures.

Medication Time Lapse Prior to Treatment

Time of last medication for pain prior to treatment varied. In the experimental group, seven individuals (64%) were medicated more than two hours prior to the

early ambulation, and four individuals (36%) received no medication prior to ambulation. In the control group, one subject (10%) received pain medication 1-2 hours prior to early ambulation, six subjects (60%) were medicated more than 2 hours prior to ambulation, and three subjects (30%) received no pain medication prior to ambulation.

Statistical Analysis of Hypotheses

Analysis of covariance was used to determine if there was a significant difference in mean pain and anxiety measures between subjects using the relaxation technique (experimental group), and subjects not using the relaxation technique (control group). Comparison of mean during and after treatment pain measures (VAS scores, and BRS-6 scores) in experimental and control group appears in Table 3. Mean total narcotic analgesic use for 24 hours was computed in Demerol equivalency and compared between experimental and control groups (see Table 4). Mean state and trait anxiety scores between groups after treatment were compared for statistical significance (see Table 5).

Table 3

Comparison of Reported Pain Perception During and After Ambulation

	Experimental		Control			
	Group		Group			
	<u>n</u> =11		<u>n</u> =10			
	<u>\bar{x}</u>	<u>SD</u>	<u>\bar{x}</u>	<u>SD</u>	<u>F</u>	<u>p</u>
Pain During Ambulation						
VAS ^a	2.96	1.94	3.4	2.5	.05	.83
BRS-6 ^b	3.09	1.22	3.2	1.75	.34	.57
Pain After Ambulation						
VAS	2.55	1.87	3.7	2.27	.56	.46
BRS-6	2.73	0.79	3.0	1.49	.25	.62

^aVAS = Visual Analog Scale

^bBRS-6 = Six Point Behavioral Rating

Table 4

Comparison of Numbers of Subjects by Groups and Analgesic Type

	Experimental	Control
Type of Analgesic		
Demerol	6	6
Codeine	1	0
Percocet	4	2
Other	0	2

Table 5

Comparison of Subject's State and Trait Anxiety Scores After Treatment

	Experimental Group $n=11$		Control Group $n=10$			
Variable	\bar{x}	SD	\bar{x}	SD	F	p
State Anxiety	37.55	9.55	36.20	6.70	0.01	.94
Trait Anxiety	34.45	8.27	32.70	8.42	1.42	.25

Hypothesis I Abdominal surgery patients who use progressive muscle relaxation after surgery will report less perception of pain post-operatively than those who do not use the technique.

The Visual Analog Pain Scale (VAS) scores collected during and after treatment were compared between groups. The mean VAS during early ambulation was 2.9 (SD = 1.9; range = 0-6.6) for the experimental group and 3.4 (SD = 2.5; range = 1.0-6.8) for the control group. These were not significantly different (F = .05, p = .83). After early ambulation, the mean VAS was 2.6 (SD = 1.9; range = 0.5-5.6) for the experimental group, and 3.7 (SD = 2.27; range = 1.2-7.2 for the control group. There was no statistically significant difference between group VAS scores (F = .56, p = .46) after early ambulation (see Table 3).

The Behavioral Rating Scale 6 (BRS-6) scores for experimental and control groups were collected during and after early ambulation and compared for differences. During ambulation, mean BRS-6 score was 3.09 (SD = 1.22; range = 0 - 4) for the experimental group and 3.2 (SD = 1.75; range = 0-5) for the control group. There were no statistically significant difference between experimental and control groups' BRS-6 scores (F (1) = .34; p = .57) during early ambulation. After early ambulation, the mean BRS-6 score was 2.73

(SD = 0.79; range = 1 - 3) for the experimental group, and 3.0 (SD = 1.50; range = 0 - 5) for the control group. There were no statistically significant differences between experimental and control groups' BRS-6 scores (F = .25; p = .62) after early ambulation (see Table 3).

Hypothesis II Abdominal surgery patients who use progressive muscle relaxation after surgery will require less medication for pain than those who do not use the technique.

Data regarding each subject's narcotic pain medication use for the first 24 hours after surgery were collected. Data were converted to Demerol equivalency in milligrams (Kastrup et al., 1985). Group mean totals for 24 hours were compared for significance (see Table 4).

Post-operatively in the experimental group, six individuals (55%) received Demerol for pain, one individual (9%) received Codeine, four individuals (36%) received Percocet. In the control group, six individuals (60%) received Demerol post-operatively for pain, two individuals (20%) received Percocet, and two individuals (20%) received other non-narcotic analgesics. Mean Demerol equivalent for the experimental group was 155.18 mg (SD = 94.12, range = 0-300 mg). Mean Demerol equivalent for the control group was 196 mg (SD = 192, range = 0-500 mg). There was no statistically

significant difference between group 24 hour Demerol equivalency means ($t(12.8) = .62, p = .55$)

Hypothesis III Patients who use progressive muscle relaxation after surgery will demonstrate lower levels of state and trait anxiety as measured by Spielberger's State/Trait Anxiety Inventory than those who do not use the technique.

There was no statistically significant difference in state or trait anxiety between experimental and control groups. After treatment, the mean state anxiety score was 37.55 ($SD = 9.55$, range = 22-54) for the experimental group and 36.20 ($SD = 6.70$, range = 30-49) for the control group. There was no statistically significant difference ($F = .01; p = .94$) in state anxiety between the two groups after treatment (see Table 5). After treatment, the mean trait anxiety score was 34.45 ($SD = 8.27$, range = 22-51) for the experimental group and 32.70 ($SD = 8.42$, range = 20-51) for the control group. There was no significant difference $F = 1.42, p = .25$ for trait anxiety between groups after treatment (see Table 5).

Other Findings

A comparison was made of the difference between state anxiety before and after treatment by group and tested for significance. State anxiety scores were lower after surgery in both groups but not significantly so.

In the experimental group, the mean state anxiety score before surgery was 41.82 (SD = 15.99, range = 23-77). After surgery, the experimental group's mean state anxiety score was 35.18 (SD = 10.29, range 22-54). There was no statistically significant difference (t = -0.80, p = 0.44) between the experimental group's state anxiety scores before and after treatment. The control group's state anxiety mean score before surgery was 41.40 (SD = 10.84, range = 28-59). After surgery, the control group's mean state anxiety score was 36.20 (SD = 6.70, range = 30-49). There was no significant difference (t = -1.35, p = 0.21) in the control group's state anxiety scores before and after surgery.

CHAPTER 5

Discussion and Summary

The purpose of this study was to determine the effect of progressive muscle relaxation (PMR) on pain perception, analgesic use, and anxiety in post-operative abdominal surgery patients. The Visual Analog Pain Scale and the Six Point Behavioral Rating Pain Scale were used to measure pain perception. In addition, analgesic use for the first 24 hours after surgery was used as a proxy for pain. Spielberger's State/Trait Anxiety Inventory was used to measure anxiety levels. The Affect Theory of Pain, Johnson's Parallel Response Model, and Selye's General Adaptation Syndrome served as a theoretical basis for operationalization of the hypotheses. Findings are discussed first, in terms of the sample itself; and then in terms of the relationships to the hypotheses proposed. The discussion is followed by conclusions based on the results obtained, implications for nursing, recommendations, and a summary.

Discussion of Demographic Data

The sample consisted of 21 individuals, 11 in the experimental group and 10 in the control group. These individuals were primarily female dependents. This sample is consistent with the population of active duty military, retired military, and their dependents in the Southwestern states. One would expect to see a

combination of young adults in the 20-35 year range reflecting active duty military and their dependents. The skew of the sample toward more females can be explained by the make-up of the active duty forces. The active duty military force is made up of a larger percentage of males than females. These individuals are typically young and healthy. Admissions to the hospital for surgery would occur primarily for emergencies such as a ruptured appendix or accident related injuries. Elective surgery would be minimal. However, the majority of the military forces are married with dependents in the local area. The dependents would be more likely to seek elective surgical intervention. Since the study was limited to elective surgical procedures, the sample resulted in more female dependents. The older adults in the sample correspond to those individuals of military retirement age (those 50 and older) and their dependents. In the older population one might expect more complex, multiple entity health problems. One would expect the population to be predominantly Christian and consist of varied ethnic backgrounds.

An average individual in the experimental group was a white, Catholic female, 39 years old with family support available in the local area. She was hospitalized for cholecystectomy or elective sterilization, relatively minor procedures. Post-

operatively she received Demerol or Percocet for pain. In the control group, the average individual was also a white, Catholic female, 37 years old, with family support in the local area. She was hospitalized for either diagnostic laparoscopy or elective sterilization. Post-operatively she received primarily Demerol for pain.

Although the differences between the two groups were not statistically significant, it was suspected that these differences might contribute to the overall lack of statistical significance in the pain levels between the two groups. There were more Hispanics in the control group than in the experimental group. Persons of Hispanic culture have a "present" time orientation (Martinelli, 1987). That is, they view the present as the only aspect of time order that can be changed (Martinelli, 1987). The future is vague and unpredictable; not easily affected by what is done in the present (Martinelli, 1987). The Hispanic cultural attitude is to do what they can about the present and let the future take care of itself (Martinelli, 1987). This attitude of present time orientation is also a part of the pain experience (Martinelli, 1987). The individual with a present-oriented time culture is concerned with the immediate situation. Questions such as the following are asked: "Will I live or die? What is this pain that I'm experiencing and what can I do to relieve it?"

(Martinelli, 1987). In fact, the members in the control group used more analgesic on the average in a 24 hour time period than did the experimental group. Though not statistically significant, this greater use of analgesics would decrease the level of pain experienced during the course of study and may have decreased the control group's mean pain scores.

Discussion of Clinical Data

Pain and Anxiety Before Surgery

The experimental group tended to have more complicated surgeries and paradoxically received less medication over the 24 hour post-operative period than the control group (see Table 1). The fact of more complex surgery and less medication would seem to predict that the experimental group would experience greater levels of pain and be more anxious before using the relaxation technique in the treatment setting. However, this was not the case. This may be due to the fact that almost all subjects were still experiencing the effects of the anesthesia when data for pain were collected. Another possibility is that early ambulation actually decreases the level of pain experienced post-operatively. It is also possible that the extra attention and education experienced pre-operatively decreased the subjects' anxiety levels both before and after surgery.

Discussion of Hypotheses

Hypothesis I Abdominal surgery patients who use progressive muscle relaxation after surgery will report less perception of pain post-operatively than those who do not use the technique.

Analysis of covariance comparing mean VAS scores during, and after treatment indicated no statistical difference between groups for pain ($F = .05$, $p = .83$; and $F = .56$, $p = .46$), respectively, for scores during and after early ambulation. Early ambulation was defined as the first or second time up walking out of the patient's room. In 19 subjects (91%) this occurred on the day of surgery and for most, within seven hours after returning from the operating room. Horowitz and colleagues (1984) also walked subjects in their study on post-operative pain in open heart surgery patients. They defined preliminary ambulation as the first or second time out of bed after surgery. This took place, however, on the second or third day after surgery, after being transferred to the intensive care step-down unit (Horowitz et al., 1984). Levin and colleagues (1987) also conducted a study on post-operative pain. In their study, pain was measured on the second and third post-operative day (Levin et al., 1987). Although neither study discussed the aspect of alertness, one would expect that the effects of general anesthesia would not

significantly impact on the level of awareness of the subjects on the second or third day post-op. Subjects in the current study tended to begin post-operative ambulation earlier than in the studies by Horowitz and Levin. This may be due to the lack of complexity of the surgeries in the current sample compared to the previous studies. With rare exceptions, individuals in the current study were still very groggy from the combination of anesthesia and pre-operative medications administered at the time when early ambulation occurred. Many of them had difficulty completing the pain scales because of drowsiness. Pre-treatment pain level scores were low (see Table 2) to begin with. With pre-treatment scores recorded in the lower one third of the VAS pain scale in most cases, the probability of achieving a significant difference in scores after treatment was reduced. There was no significant difference ($F = .34$, $p = .57$; $F = .25$, $p = .62$) between groups for mean BRS-6 scores during and after early ambulation. Both groups tended to under-rate their pain on the BRS-6 tool. The investigator observed that all subjects in the sample required physical assistance in getting out of bed. All subjects splinted the area of incision during movement. With rare exceptions, all subjects grimaced with movement, stood hunched over instead of standing straight, and walked slowly with shuffling steps instead

of picking up their feet and moving briskly. Despite having been asked to read all six pain level statements carefully on the evening before surgery, few individuals marked any level beyond "pain present, cannot be ignored, interferes with concentration" (See Appendix G). Only one individual in the experimental group, and two in the control group marked the most severe pain statement "pain present, cannot be ignored, rest or bed rest required." The meaning of each statement in the BRS-6 tool was not discussed prior to surgery. It is conceivable that the individuals mis-interpreted the level of pain these statements represented, since most marked "pain present and cannot be ignored; does not interfere with everyday activities," despite the fact they were in the hospital, receiving pain medication, and not even getting up to the bathroom without assistance.

Huskisson (1974) discussed the difference of opinion among researchers on who is best qualified to measure pain, the subject or the observer. Although individuals may have some difficulty initially expressing their level of pain within the descriptive boundaries of a particular scale, they can learn to use a standard pain scale. Huskisson contended that an observer, no matter how experienced, could never measure another person's pain better than the individual himself (Huskisson, 1974). For this to be the case, it is necessary for the

individual to understand all aspects of the measurement tool he is using to measure his pain and be alert enough to utilize the tool in an accurate manner. This may have created a flaw in the current study.

Another factor to be considered in analyzing the low pain scores of both groups is the fact that almost all subjects were female. Miller and Shuter (1984) conducted a study on post-operative patients to determine the effect of gender on pain perception. Their sample consisted of 31 females and 29 males. Interviews were conducted to allow patients to describe their pain. Transcripts of these interviews were analyzed by two independent raters to identify and rate pain descriptors as to how specific they were in describing levels of pain. Analysis of variance showed males used pain descriptors of higher intensity more frequently than females ($F = 9.24$, $p < .01$). In the current study, the almost all female sample may have contributed to the overall low pain perception scores.

Although score differences were not significant, the experimental group's during ambulation and after ambulation pain scores tended to be less than their pain scores before the relaxation treatment. The pain scores of the control group during and after early ambulation tended to be higher than the scores before ambulation.

This is interesting in light of the more complicated surgical procedures done on the experimental group.

Hypothesis II Abdominal surgery patients who use progressive muscle relaxation after surgery will require less medication for pain than those who do not use the technique.

The mean Demerol equivalent medication usage for 24 hours for the experimental group was 155 milligrams (SD = 94.12; range 0-300 mg). The mean Demerol equivalent medication usage for 24 hours for the control group was 196 milligrams (SD = 192; range 0-500mg). There was no statistical significance in mean pain medication usage for 24 hours (t = -0.62, p = 0.55). It is interesting to note, however, the extremely large standard deviation of the control group. The subjects in the control group either had little or nothing for pain, or they required a comparatively large amount of pain medication post-operatively in the first 24 hours after surgery. In the control group, four individuals who received minimal pain medication after surgery were post-operative diagnostic laparoscopies. There was minimal surgical trauma and the anticipation of waking up to a more complex surgery did not become a reality. From Beecher's (1956) study, we learn that degree of pain is not solely dependent on the amount of tissue damage inflicted. The individual's association of that wound to

perceived danger also has a great impact on how much pain will be experienced. If the injury is seen as a release from greater danger, pain will be less (Beecher, 1956). In the experimental group, four individuals had cholecystectomies. This procedure may have been perceived as a method of release from the pain of acute gall bladder attacks and subsequently lowered their pain score levels.

Hypothesis III Patients who use progressive muscle relaxation after surgery will demonstrate lower levels of state and trait anxiety as measured by Spielberger's State/Trait Anxiety Inventory than those who do not use the technique.

Between group differences for state anxiety after treatment were not statistically significant ($F = .01$; $p = .94$). Differences between the two groups were expected in the state anxiety level; that is, that level of anxiety experienced at a given point in time. One would expect the subjects who used the progressive muscle relaxation technique would show a decreased level of state anxiety. The results indicate that both groups experienced a decrease in state anxiety after treatment. It is unclear whether the decrease in anxiety level was due in part to the relaxation technique used by the experimental group or other extraneous variables. Completion of the surgery removed a stressor from the

subject's focus, thus relieving stress and decreasing anxiety. Selye's (1976) General Adaptation Theory of stress explains this point. A stressor of any kind initiates the stress response which corresponds to the fight or flight response. The removal of that stressor, allows the sympathetic arousal of the fight or flight response to decrease and the effects of the parasympathetic nervous system to take precedence (Selye, 1976). In the case of the present study, the anticipation of having the surgery, the actual surgery and anesthesia, and concern about the diagnosis and possible complications of the surgical procedure were stressors. After surgery, these stressors no longer existed.

No differences were expected for trait anxiety since it is a long term level of anxiety proneness. Using the relaxation technique once or twice was not expected to effect this measure. Pre-treatment trait anxiety scores were not significantly different ($t = .2449$, $p = .8092$). There were no significant differences in trait anxiety scores between groups after treatment ($F = 1.42$; $p = .25$). Infante and Mooney (1987) proposed that past unfavorable experiences with pain and the fear of being unable to cope with the pain may cause a negative behavioral response which is related these past experiences and the anxiety provoked by them (Infante &

Mooney, 1987)). The influences of culture, education, and religion also determine the cognitive response of the individual and their personality or behavioral pattern (Infante & Mooney, 1987)).

Extraneous variables may have effected the study results by changing the expected levels of pain and anxiety. The anticipation versus reality factor of pain was one of these extraneous variables. Five individuals in the control group went into the operating room for a diagnostic laparoscopy. All of the individuals undergoing this procedure faced the possibility of cancer and much more extensive surgery. None of them required the more extensive procedure. The anticipation of severe consequences was present pre-operatively, but because the "worst case scenario" did not occur, the resultant level of anxiety and degree of pain was much less than if the anticipated "worst case scenario" had occurred. The laparoscopic surgery could have been perceived as a minor set back compared to what might have occurred, and anxiety level post-operatively decreased. This corresponds with Beecher's (1956) theory that the meaning of the pain experience is important to the level of pain felt (Beecher, 1956). We might further hypothesize that the meaning of the experience also impacts on the level of anxiety felt.

The added time spent with the subject by the investigator in completing the study may have been perceived as positive attention and decreased the level of state anxiety in both groups. Egbert and colleagues (1964) conducted a study of surgical patients to determine the effect of encouragement and instruction in reducing post-operative pain (Egbert, Battit, Welch, & Bartlett, 1964). They studied 97 patients undergoing elective abdominal surgery. Half of the patients (the experimental group) were given special instruction about what to expect in the way of post-operative pain, how severe it would be, how long it would last, what would be done to relieve it, and how they could help to relieve the pain themselves through use of relaxation techniques. They were taught a relaxation technique, as well as how to move around in the bed and how to use a trapeze to assist in moving. The patients in the experimental group were also encouraged to request pain medication if at first they found it difficult to achieve a state of comfort. The control group was not given any special instruction. Control subjects had a trapeze apparatus but were not instructed in its use. Post-operatively, the subjects in the experimental group were visited by the investigator daily until they had no further need of narcotic analgesics. The techniques taught the night before surgery were reviewed and subjects were encouraged

to use these techniques. Subjects were reassured that the pain they were experiencing was normal and to request medication as needed for comfort. The control group followed the normal post-operative recovery course without visits from the investigator. An independent observer recorded the patients' evaluations of their pain as well as objective reports. There was no statistical difference between groups for pain on the day of surgery. However, for the first five post-operative days, the experimental group requested less narcotics ($p < .01$) and appeared more comfortable to the observer than the control group. Patients in the experimental group were sent home on an average of 2.7 days earlier than the control group ($p < .01$). The study suggests that encouragement, education, and attention given to surgical patients helps improve the post-operative course by decreasing need for pain medication and shortening length of stay. Subjects in both groups in the current study were given additional attention and education by the investigator both before and after surgery. An attempt was made by the investigator to make the groups more nearly equal by devoting equal time to each member before and after surgery. It is possible that this attempt at equal time produced a type of Hawthorne effect where the subjects interpreted the attention as good and responded

positively to it. Thus, anxiety and pain levels decreased post-operatively in both groups.

Another factor to consider in interpretation of the results is that subjects in the experimental group may not have enough time to adequately learn the relaxation technique. All individuals responded positively to the initial practice session conducted by the investigator. They verbalized feeling relaxed and demonstrated observable physical relaxation. All subjects verbalized feelings of heaviness of limbs and feeling very comfortable and sleepy. Many of subjects relaxed to the point of falling asleep. However, the treatment on the day of surgery, was administered by tape, without the presence of the investigator. Although the tape was a duplicate of the technique taught pre-operatively, the subjects had not been exposed to the use of the tape prior to this time. In order for relaxation to occur, the subjects were required to concentrate on the taped instructions at the same level they did when the investigator was present. The required level of concentration may not have occurred due to unfamiliarity with the tape or the drowsiness of the subjects. In at least one-third of the cases, the investigator had to return at a later time to conduct the measurement portion of the study, because the subjects would fall asleep

while listening to the tapes. This appeared to occur equally in both experimental and control groups.

Pender (1986), in her study on the effects of progressive muscle relaxation training on anxiety and health locus of control, taught subjects the relaxation technique in three weekly training sessions and encouraged subjects to practice the technique at home. Scandrett and colleagues (1986) also utilized a progressive muscle relaxation technique in two of their studies. In both cases, subjects were given several chances to learn and practice the technique over a period of two days. Individuals were encouraged to practice the technique at home (Scandrett et al., 1986). Individuals in the current study had much less time to learn the technique effectively and so, were not able to derive maximum benefit from the relaxation.

Limitations to the Study

Analysis and interpretation of statistics was made difficult because of the small size of the sample. Had there been more individuals in each group, a clearer picture of pain level trends may have emerged.

The time of early ambulation was considered to be the major flaw of the study. Measurement of pain on the day of surgery is now seen as inappropriate. Subjects in almost all cases were too groggy from anesthesia and pre- and post-operative medication for clear and full

cooperation in completing estimates of pain and anxiety. According to Infante and Mooney (1987), the expression of pain requires a certain level of cognitive functioning to perceive the stimulus and respond to it. Patients under general anaesthesia do not experience pain until they are sufficiently awake to be aware of the pain stimulus (Infante & Mooney, 1987). The medication in the subjects' system may have decreased the amount of perceived pain. It is believed that this contributed greatly to the non-significant results.

Conclusions

No conclusions can be drawn from the results of this study. The study showed no significant differences in pain, analgesic use, or anxiety levels for individuals using progressive muscle relaxation and those not using the technique. Although the experimental group exhibited a trend toward less pain and less analgesic use, the small size of the groups makes it impossible to predict whether this trend may have resulted in significant differences had the groups been larger.

Recommendations

The researcher recommends repetition of the study with a larger number of subjects in each group. This investigator limited the study to include only individuals undergoing elective abdominal surgery in order to make the levels of pain in the groups more

comparatively equal. But, by taking into account the subjects' pain levels before, as well as during and after treatment, it should not matter what type of surgical subjects are included as long as they are randomly assigned to groups so each group can be considered equal.

Attention by the investigator may have contributed to the decreased levels of pain and anxiety in both groups. The addition of a third group of subjects whose pain level would be measured post-operatively by nurses staffing the unit would serve as an additional control. The investigator would have no contact with the group. The individuals would be instructed by nurses on staff in the use of the three measurement tools. They would be told it was a method being used to determine the effectiveness of different pain relief measures.

Conducting the study on the first post-operative day might result in more obvious differences than in this study. The effects of pre-operative medication and anesthesia would be diminished and subjects' initial, pre-treatment pain level would most likely be higher. The potential effect of the progressive muscle relaxation would be seen more clearly in the post-treatment results. Subjects would be more alert and better able to participate in the study.

Implications for Nursing

The trend in this study was toward a decreased level of pain and anxiety in the experimental group. Subjects in the experimental group did experience a decrease in pain instead of the normally expected increase during their first ambulation. Although surgical procedures were more complicated with greater potential for pain due to tissue damage, the individuals in the experimental group tended to have less pain after using the technique. The technique caused no harm. No subject in the experimental group experienced any symptoms of hypotension other than what is normally expected in sitting up and standing for the first time after surgery. Subjects in the experimental group were enthusiastic about learning the technique and its potential for decreasing pain. Progressive muscle relaxation in its modified form causes no harm, may do some good, and is perceived by the patient as having a potential for doing good. The technique is easy to teach, simple to learn, and takes only the small amount of the nurses' time initially. These reasons, in themselves, are strong enough arguments for teaching and encouraging use of the technique in interested individuals. The benefit in reduction of perceived pain and anxiety has not been determined, but the potential is there.

Summary

Although inconclusive, this study adds to the information from previous studies on the usefulness of progressive muscle relaxation in treating post-operative pain. It is clear that further study is necessary to predict the effect of progressive muscle relaxation on pain and anxiety. However, the potential benefits should not be ignored by nurses who wish to provide new, innovative methods of pain control to their patients.

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APPENDIX A
Relaxation Technique

Relaxation Technique

1. Sit quietly or lie in a comfortable position. Arms at your side or in your lap, palms facing up. Don't cross your legs. Close your eyes.
2. Take a deep breath. Breathe in through your mouth and out through your nose. Take another deep breath. In . . . out . . . Feel your body relaxing, relaxing . . .
3. Concentrate on your left foot. Wiggle the toes in your left foot. All the muscles in your left foot are beginning to relax. Your left foot is becoming very, very heavy.
4. Concentrate on your right foot. Wiggle the toes in your right foot. All the muscles in your right foot are beginning to relax. All the muscles in your right foot, instep, arch, heel, ankle are becoming relaxed and heavy.
5. Now concentrate on the left calf or lower leg. Tell yourself "my left leg is beginning to relax, it feels limp, flaccid, heavy." Your left ankle and foot are very relaxed and heavy.
6. Concentrate on the right calf. Tell yourself "my right leg is beginning to relax. It feels limp, flaccid, heavy." Your right ankle and foot are very relaxed and heavy.

7. Next concentrate on the left thigh. Command the left thigh to relax. Relax. Your left thigh feels relaxed and heavy. The left knee, calf, ankle and foot all relaxed and heavy.
8. Concentrate on the right thigh. Command the right thigh to relax. Relaxed, heavy. The right thigh, knee, calf, ankle, and foot are all relaxed and heavy.
9. Relax the left hip. Relax the left hip completely. Relaxed and heavy. (repeat downward progression).
10. Relax the right hip. Relax the right hip completely. Relaxed and heavy. (repeat downward progression).
11. Relax the small of the back. All the way across the small of the back the muscles are becoming relaxed and heavy (repeat downward progression on right and left sides).
12. Relax the stomach and lower abdomen. Tell all the muscles in the stomach and lower abdomen to relax. (read back and left and right progression).
13. Relax all the muscles down the spine, between the shoulder blades, from the top of your neck to the tail bone, relaxed and heavy. (repeat progression).
14. Relax all the muscles of your chest from your collar bone through each rib, relax. All the muscles in your shoulders relaxed and heavy. Let your

shoulders droop. Completely relax. (repeat progression).

15. Relax all the muscles through the shoulder. Relax the muscles around the shoulder blades. All the muscles through your left upper arm, through the lower arm, hand and fingers. Feel the tension flow right out of the fingertips. Like water flowing down a mountain stream. Relaxed and heavy.
16. Relax all the muscles of the right arm, lower arm, hand and fingers. Feel the tension flow right out of the fingertips. (repeat progression).
17. Relax all the muscles in the back of your neck. All the way up the back of your head, all the muscles of your scalp, relaxed. Feel the muscles of your scalp begin to tingle as they relax.
18. Relax the muscles of your forehead and temple. Relax. Concentrate on the muscles around each ear. Relax. All the muscles down the sides of the face, relax. Relax the eyebrows. Your whole face feels heavy and relaxed.
19. Concentrate on a spot in front of your right ear. Imagine a spot about the size of a nickel in front of your right ear. There is a nerve there that controls all the muscles of your lower face. Tell those muscles to relax.

20. Concentrate on the same spot in front of your left ear. Tell the muscles to relax. Your entire face is relaxed. Let your mouth open. Your jaw is limp. The muscles under your chin are relaxed. Your head is so heavy.
21. (repeat backward progression).
22. Your whole body is completely relaxed and heavy. So relaxed, so heavy. You feel no tension what-so-ever. You are completely tranquil, completely relaxed.

APPENDIX B

Technique for Getting Out of Bed

Technique for Getting Out of Bed

Hello, my name is Bonnie. I'm going to teach you a technique to use when getting out of bed after your surgery. Obviously, when you've had surgery and have an incision in the stomach area, you're not going to be able to bounce out of bed like you're used to doing. Getting up too quickly and in the wrong way can put a strain on the cut muscles and cause you unnecessary discomfort. It can also make you very dizzy. This is because when you stand quickly, the blood in your body drops to your feet. your brain doesn't get enough oxygen and it reacts by making you feel dizzy.

So, the first rule for getting out of bed after surgery is: SLOW AND EASY. Whether you're normally very athletic or not, until your body compensates for the surgical anesthesia and the pain medication you're taking, you need to get up gradually. This gives your body time to adjust to a different position.

You don't want to put strain on the stomach muscles, so instead of sitting up straight from laying on your back, you're going to turn on your side and get up from a side lying position. Make sure you have a nurse or technician with you to help you the first few times you get up. Now, to get out of bed, first:

1. Turn on your side facing the side of the bed you want to get out on.

2. Ask the nurse or technician to roll the head of your bed up to about 30 degrees or where ever you feel most comfortable.

3. Next, use your lower arm as a lever to push yourself up from the bed by straightening your elbow into a straight and locked position.

4. At the same time use your other arm to push your body up using the side rail of the bed.

5. Slide your legs over the edge of the bed onto the floor. DO NOT ATTEMPT TO STAND IMMEDIATELY! It may, very well, make you dizzy enough to pass out.

6. Sit at the edge of the bed for one or two minutes. Take a couple of deep breaths.

7. While you are sitting, wiggle your toes and point your toes up towards the ceiling. This tightens the muscles in your lower legs and helps pump blood back to your head to prevent the dizziness. Move your arms a little. Shrug your shoulders, get the kinks out of your shoulders. Rotate your head in a circle. Feel the muscles loosen up.

8. When you feel clear headed, slide as far as you can to the edge of the bed until you are just resting your bottom on the edge.

9. Place the arm nearest to the side rail on the railing and use it to push yourself into the standing

position. DO NOT LET GO OF THE RAILING UNTIL YOU FEEL STEADY ON YOUR FEET.

10. As you walk, concentrate on the taking slow deep breaths and tightening the muscles in your lower legs to prevent dizziness.

11. If you begin to feel dizzy at any time during the walk, let your nurse know. He or she will help you to sit down.

12. When you return to bed, use the same technique in reverse to get back into the bed.

13. First, turn with your back to the bed. Position yourself as close to the side rail at the top of the bed as you can get.

14. Hold onto the side rail, and slowly lower your body onto the bed in a sitting position. Use your arm on the side rail to support your body's weight as you sit down. Scoot as far back on the bed as you can so you're sitting firmly on the mattress and not on the edge.

15. Sit for a minute and take several deep breaths. Wiggle your toes. Point your toes to the ceiling.

16. Now, using the arm closest to the top of the bed, put your hand on the mattress and slowly bend at the elbow to lower yourself onto your side on the bed. At the same time, lift, or have someone help you lift your feet onto the bed.

17. Ask the nurse to roll your bed down to a comfortable position.

18. Roll onto your back or any other position you choose.

APPENDIX C
Introduction

Introduction

My name is Bonnie Mertely. I am an active duty Air Force nurse working as a graduate student in medical-surgical nursing at Arizona State University. I am interested in learning more about surgical patient's discomfort and what nurses can do to alleviate that discomfort. I believe there are types of nursing care that can be used alone, or together with medication to help patients control their discomfort. I would like you to participate in this study. The study will not subject you to any more discomfort than what is normally expected from the type of surgery you will be having. I will ask you to take a short test to determine your level of anxiety before surgery. Then I will talk to you for about 20 minutes and give you some information you can use after surgery. After surgery, I will ask you to listen to a tape of the same information I discussed with you before surgery. Then you will be assisted getting up out of bed and asked to record the pain you feel during ambulation by marking pain scales at different time intervals during your walk. After your walk, I will ask you to retake the anxiety inventory. Your doctor, Dr. _____, has given me permission to ask for your participation in this study. All information will be used for educational purposes only. Your name will not

be used. Do you have any questions you would like to ask about the study? Would you be willing to participate?

APPENDIX D
Informed Consent Form

Informed Consent Form

Bonnie Mertely, who is a graduate student of nursing at Arizona State University has requested my participation in a research study at this institution. The topic of the research is "Alternative Methods of Pain Control in Post-Operative Abdominal Surgery Patients."

I have been informed that the purpose of the research is to determine the effects of pain control techniques on post-operative patients who have undergone abdominal surgery.

My participation will involve two visits from the investigator, Bonnie Mertely. On the first visit, I will be asked to take a short written test to determine how I feel and I will be taught a technique to reduce surgical discomfort. On the second visit, I will listen to a tape of the information given to me by the investigator. After listening to the tape, I will be assisted in walking for the first or second time. I will be asked to evaluate my pain by marking a position on a line that ranges from no pain to severe pain. I understand I will do this at three different intervals during the walk. Upon returning to bed, I will retake the test given the day before.

My medical chart will be reviewed to collect information about my surgery and the pain medicine I am

receiving. My name or any other identifying information will not be used on any piece of paper used in the study.

I understand that one of the possible benefits of my participation in the research is that I may experience less discomfort and anxiety after surgery and may not require pain medication as frequently. I will also be contributing to a study which will provide important information about pain control after abdominal surgery. Thinking about pain occasionally makes people more uncomfortable, and this may happen to me. Medication for discomfort and other nursing care measures are routinely provided for persons who have had surgery and will be available to me if I feel I need them at any time to control my post-operative discomfort.

In the event of physical injury or illness, facilities and professional care will be made available as under normal military health benefits programs. In case of injury the medical staff will be informed immediately to implement appropriate interventions.

I may withdraw from the study at any time and continue to receive all medical and nursing care required by my surgery.

Any questions I have concerning the research study or my participation in it, before or after my consent, will be answered at any time by Bonnie Mertely, Major, USAF, NC or Dr. Ruth Zornow, College of Nursing, Arizona

State University, Tempe, Arizona 85287 (966-3984). A copy of the final results may be obtained by providing Bonnie Mertely with a stamped, self-addressed envelope at some time during participation in the study.

I understand that in case of injury, if I have questions about my rights as a subject/participant in this research, or if I feel I have been placed at risk, I can contact the Chair of the Human Subjects Research Review Committee, through the Committee Secretary (965-2170).

In signing this consent form, I am not waiving any legal claims, rights, or remedies nor releasing the research investigator, the sponsor, the institution or its agent from liability or negligence as would normally follow under my military sponsorship.

I have read the above Informed Consent. The nature, demands, risks, and benefits of the project have been explained to me. A copy of this consent form will be given to me.

Subject's Signature _____ Date _____

I certify that I have explained to the above individual the nature and purpose, the potential benefits and possible risks associated with participation in this research study, have answered any questions that have been raised, and have witnessed the above signature.

These elements of Informed Consent conform to the assurance given by Arizona State University to the Department of Health and Human Services to protect the rights of human subjects.

I have provided the subject/participant a copy of this signed consent document.

Date _____ Signature of Investigator _____

APPENDIX E

Pre-Operative Instructions

PRE-OPERATIVE INSTRUCTIONS

NPO from midnight before surgery until okayed after surgery. Betadine or Hibiclens shower evening before surgery. Remove nail polish. Enemas, douches, TED hose or other treatments as ordered. Sleeping pill usually ordered at bedtime. Awakened early a.m. day of surgery. Take another Betadine or Hibiclens shower. Brush teeth, rinse mouth. Remember not to drink anything. Wear long hospital gown. Remove all jewelry, glasses, dentures or other prosthesis. Empty bladder when instructed, pre-op medication will then be given. Remain in bed AFTER medication is given, use call bell to summon nurse.

POST-OPERATIVE INSTRUCTIONS

Move about in bed as soon as possible. Exercise legs, tighten calf muscles, turn from side to side. Cough and deep breathe frequently. Splint incision with pillows. Take two deep breaths. Inhale third breath deeply, hold it for a moment, then cough out forcibly. May also use blow bottles, or blow a glove or incentive spirometer. Out of bed ambulatory with assistance until stable on feet. I.V. present. Notify nursing staff if any redness, swelling or pain at injection site.

Medication for pain will usually be ordered every 4-6 hours and will not routinely be brought to you. Ask for it when needed.

Dressings may have some drainage and/or bleeding and will be frequently checked by the nursing staff.

We will observe and often measure your intake and urinary output. Notify nursing staff when you first drink any fluids, urinate or are unable to urinate or have nausea or vomiting.

Other special equipment (i.e. foley, supra-pubic, N/G scrotal support, sitzbaths, etc.)

Instruction/demonstration given by _____
I have received adequate instruction/demonstration in the above procedures and I understand when, why and how to do them.

Date & Time _____ Patient's Signature _____

APPENDIX F

Spielberger's State-Trait Anxiety Inventory

Spielberger's State-Trait Anxiety Inventory

DIRECTIONS: A number of statements which people have used to describe themselves are given below.

Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel right now, that is at this moment.

There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	not at all	somewhat	moderately so	very much so
1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense.	1	2	3	4
4. I am regretful.	1	2	3	4
5. I feel at ease.	1	2	3	4
6. I feel upset.	1	2	3	4
7. I am presently worrying over possible misfortunes.	1	2	3	4
8. I feel rested	1	2	3	4
9. I feel anxious.	1	2	3	4
10. I feel comfortable.	1	2	3	4
11. I feel self-confident	1	2	3	4
12. I feel nervous.	1	2	3	4
13. I am jittery.	1	2	3	4
14. I feel "high strung".	1	2	3	4
15. I am relaxed.	1	2	3	4

	not at all	somewhat	moderately so	very much so
16. I feel content.	1	2	3	4
17. I am worried.	1	2	3	4
18. I feel over-excited and "rattled" .	1	2	3	4
19. I feel joyful	1	2	3	4
20. I feel pleasant	1	2	3	4

DIRECTIONS: A number of statements which people have used to describe themselves are given below.

Read each statement and then circle the appropriate number to the right of the statement to indicate how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	not at all	somewhat	moderately so	very much so
21. I feel pleasant	1	2	3	4
22. I tire quickly.	1	2	3	4
23. I feel like crying.	1	2	3	4
24. I wish I could be as happy as others seem to be	1	2	3	4
25. I am losing out on things because I can't make up my mind soon enough.	1	2	3	4
26. I feel rested	1	2	3	4
27. I am "calm, cool, and collected". .	1	2	3	4
28. I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
29. I worry too much over something that really doesn't matter.	1	2	3	4
30. I am happy.	1	2	3	4
31. I am inclined to take things hard .	1	2	3	4
32. I lack self-confidence.	1	2	3	4
33. I feel secure	1	2	3	4
34. I try to avoid facing a crisis or difficulty.	1	2	3	4
35. I feel blue	1	2	3	4

	not at all	somewhat	moderately so	very much so
36. I am content.	1	2	3	4
37. Some unimportant thought runs through my mind and bothers me. . .	1	2	3	4
38. I take disappointments so keenly that I can't put them out of my mind.	1	2	3	4
39. I am a steady person.	1	2	3	4
40. I get in a state of tension of turmoil as I think over my recent concerns and interests.	1	2	3	4

APPENDIX G
Analog Pain Scale
and
Six Point Behavioral Rating Scale

Analog Pain Scale

Draw a vertical line through the line below at the point that best describes the amount of pain you are experiencing.

No pain Most intense pain

THE 6 POINT BEHAVIORAL RATING SCALE

Place a check mark in front of the statement that best describes your pain at this moment. Check only one.

- () No pain.
- () Pain present, but can easily be ignored.
- () Pain present, cannot be ignored, but does not interfere with everyday activities.
- () Pain present, cannot be ignored, interferes with concentration.
- () Pain present, cannot be ignored, interferes with all tasks except taking care of basic needs such as eating and toileting.
- () Pain present, cannot be ignored, rest or bedrest required.

BIOGRAPHICAL SKETCH

Bonnie Ann Mertely v [REDACTED]

[REDACTED] She received her elementary and secondary education in Eveleth, Minnesota. In 1974, she received her diploma from St. Luke's Hospital School of Nursing, Duluth, Minnesota. She entered the Air Force Nurse Corps in November of 1974 and has travelled all over the United States and the Far East. She has held positions as staff nurse on medical and surgical units, coronary care, and intensive care. She has also held the position of charge nurse of a surgical specialty unit and evening supervisor of a medical center. Some of her unique assignments include flight nurse and flight instructor, hospital infection control nurse, and instructor, Nursing Service Management courses. In 1984, she received her Bachelor of Science degree in Nursing from The Catholic University of America in Washington, D.C. In August of 1987, she entered the graduate program in nursing at Arizona State University where she concurrently holds the position of Liason Officer, Air Force Institute of Technology. She is a member of the American Nurses Association and its Arizona branch, the American Association of Critical Care Nurses, the Aerospace Medical Association and its Flight Nurse section, the Air Force Association and Sigma Theta Tau.